Form 1
Regulation 9

637129

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CONVENTION APPLICATION FOR A STANDARD PATENT

WE, **EUREA VERPACKUNGS GmbH & CO. KG** of Industriestrasse 55-57, 4440 Rheine 11 - Mesum, West Germany, hereby apply for the grant of a standard patent for an invention entitled **HIGH-STRENGTH SYNTHETIC FIBER FABRIC AND ITEMS MADE FROM SUCH FABRIC** which is described in the accompanying complete specification.

The actual inventor of the said invention is: Egon WURR

Details of Basic Applications:-

Number of Basic Application:	G 89 09 967.2
Convention Country in which Basic Application was filed:	West Germany
Date of Basic Application:	19th August, 1989
ISO Code:	DE
Number of Basic Application:	P 39 38 414.4
Convention Country in which Basic Application was filed:	West Germany
ISO Code:	DE
Date of Basic Application:	18th November, 1989

OUR address for service is SMITH SHELSTON BEADLE, 207 Riversdale Road, (P O Box 410), Hawthorn, 3122, Victoria, Australia (Attorney Code SA).

DATED THIS 13th DAY OF August, 1990

SMITH SHELSTON BEADLE
Patent Attorneys for the Applicant

TO: The Commissioner of Patents
Our Ref: #5906 TNB:MW:WB 7eur

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Section 29(1)
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NOTICE OF ENTITLEMENT

We, **EUREA VERPACKUNGS GmbH & CO KG**, of Industriestraße 55–57, 4440 Rheine 11 – Mesum, Federal Republic of Germany, being the applicant in respect of Application No. 60929/90, state the following:–

The persons nominated for the grant of the patent:

has entitlement from the actual inventor Egon WURR, of Mohnstraße 15, 4440 Rheine, West Germany, by assignment.

The persons nominated for the grant of the patent:

are the applicants of the basic applications listed on the patent request form

The basic applications listed on the request form:

are the first applications made in a Convention country in respect of the invention

DATED this 10th day of March, 1993.

CARTER SMITH & BEADLE
Patent Attorneys for the Applicant

Our Ref: #5906 MAW:SM

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HIGH-STRENGTH SYNTHETIC FIBER FABRIC AND ITEMS MADE FROM SUCH FABRIC

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(56) Prior Art Documents
US 4606968
US 4420529
FR 2287541

(57) Claim

1. A fabric made of synthetic fibers or plastics threads which in addition to electrically non-conductive threads also has electrically conductive threads which are woven in both in the warp and the weft, characterized in that the electrically conductive threads are made of a polyolefin and contain soot and/or graphite dispersed therein, and with the rest of the fibers and threads yield a high-strength fabric which is suitable for producing bulk containers.

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COMPLETE SPECIFICATION

FOR OFFICE USE

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Complete Specification – Lodged:
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TO BE COMPLETED BY APPLICANT

Name of Applicant: EUREA VERPACKUNGS GmbH & CO. KG

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Complete Specification for the invention entitled:

HIGH-STRENGTH SYNTHETIC FIBER FABRIC AND ITEMS MADE FROM SUCH FABRIC

The following statement is a full description of this invention, including the best method of performing it known to us:

Our Ref: # 5906 TNB:MW:WB 7eur

The present invention relates to a high-strength fabric of synthetic fibers or synthetic threads which have both electrically nonconductive threads and electrically conductive threads. The electrically conductive threads preferably contain electrically conductive carbon dispersed in them. The invention relates also to bulk material containers and carrying straps made from this synthetic fiber fabric.

Fabrics of natural or synthetic fibers or threads often tend to take on an electrostatic charge, especially when they are subjected to rubbing at low atmospheric humidity. The tendency to accumulate an electrostatic charge is particularly pronounced in fabrics of hydrophobic fibers; that is, fibers of complete synthetic polymers such as polyamides, polyesters, polyacrylates, polyacrylonitriles and polyolefins.

Electrostatic charges are a nuisance especially on clothing and carpets, since sometimes such charges become so great that a person coming in contact with a grounded object receives a strong

electric shock. Moreover, electrostatic charges can be worse than a nuisance when in the vicinity of sensitive electronic circuits. Finally, the electrostatic charges can be very dangerous when such fabrics are used near explosive materials and/or in an environment where there is a risk of explosion.

Bulk containers, made from synthetic fiber fabrics, are used for a great variety of bulk goods. However, an achieved internal resistance in the fabric of the container of no more than 10^4 ohms is still insufficient to overcome the danger of explosion resulting from static charging in the filling or emptying of the containers. In mining, for example, to prevent initiating an explosion due to static electricity produced in the filling or emptying of bulk containers in an area where there is danger of explosion due to gas or vapors, bulk containers have heretofore been used which are made from a fabric incorporating metal threads that dissipate the static charge.

A disadvantage of this solution is that these metal threads are often incorporated into the fabric as warp threads alone, so that their dissipative ability is limited. In addition, the elongation characteristic of the metal fibers or threads differs

greatly from that of the rest of the fabric. This often leads to breakage of the metal threads and hence to an interruption of their ability to dissipate static charges. Due to such interruptions, the danger of sparking and explosion are greatly increased if static electric charging takes place.

It is also known to use synthetic fiber fabrics which have been rendered conductive, or not electrically chargeable, by a special chemical sizing to carry off static electricity. It has been found, however, that this antistatic sizing cannot be lastingly applied to the fabric.

The German patent publication DE-B 1,928,330 discloses fabrics which, to prevent electrostatic charging, consist of two different fiber materials. One of these materials contains electrically conductive carbon black dispersed through the entire fiber, while the other is free of carbon black. A disadvantage of this fabric is that, because it contains threads in which the carbon black is dispersed through the entire fiber, if the carbon black is contained in the fiber in an amount sufficient to achieve enough electrical conductivity the strength and stretchability of the fabric are reduced. It is to be noted that sufficient electrical

conductivity cannot be achieved if the amount of carbon black contained in the fiber is too small.

SUMMARY OF THE INVENTION

A principal object of the present invention is to provide a synthetic fiber fabric in which threads of conductive material incorporated into the nonconductive synthetic fiber fabric are largely similar in their elongation characteristics to the conventional synthetic fabric and in which a lasting removal of the static electricity assured.

In contrast to the statements made in the aforementioned DE-B-1,928,330, it has surprisingly been discovered that the above stated object can be achieved in a high-strength fabric of the kind described above if the electrically conductive threads (1) consist of a polyolefin, (2) contain dispersed carbon black and/or graphite, and are (3) woven into both the warp and filling of the fabric. The fabric according to the invention has extraordinary mechanical strength and lastingly performs a reliable dissipation of static electricity.

Accordingly the invention provides a fabric made of synthetic fibers or plastics threads which in addition to electrically non-conductive threads also has electrically conductive threads which are woven in both in the warp and the weft, characterized in that the electrically conductive threads are made of a polyolefin and contain soot and.or graphite dispersed therein, and with the rest of the fibers and threads yield a high-strength fabric which is suitable for producing bulk containers.

Furthermore the invention provides a bulk container, a so-called FIBC, which consists of a flexible carrying bag (5) which has a collar region (6) and a cover region (10) with a filler neck (8) and which is provided with carrying means, for instance carrying loops (7), characterized in that the carrying bag (5) is made of a high-strength fabric of synthetic fibers or plastics threads which in addition to electrically non-conductive threads also has electrically conductive threads which are woven in both in the warp and in the weft, the electrically conductive threads being made of polyolefins and contain soot and/or graphite dispersed therein.

In another embodiment the invention provides a carrying strap for attaching loads to support harnesses, consisting of a high-strength fabric of synthetic fibers or plastics threads, which in addition to electrically non-conductive threads also have electrically conductive threads, which are woven in both in the warp and in the weft, the electrically conductive threads being made of a polyolefin and containing soot and/or graphite dispersed therein.

It is advantageous if the modulus of elasticity $\in$ of the

electrically conductive threads is made lower than that of the rest of the thread material woven into warp and filling. This prevents the electrically conductive filaments from breaking if the fabric is subjected to great mechanical stress.

The conductive threads advantageously consist of polypropylene. The general characteristics and especially the elongation of this material are largely the same as those of synthetic threads used for the manufacture of high-strength fabrics. The conductive threads are woven into the base fabric both in the warp and in the filling. Due to the weaving in the direction of the warp and filling and to the crossing of the warp and filling threads, the base fabric is shot through with a right-angle lattice of electrically conductive threads. If they are appropriately grounded, these threade provide a lasting dissipation of the static electricity formed when the fabric is in use. Due to the weaving of the electrically conductive threads into the fabric a dissipating resistance of 10^7 to 10^9 ohms is achieved (in a measuring arrangement according to DIN -- German Industrial Standard -- No. 53 482).

The values given above can be varied. Even lower values may

be achieved. For this purpose it is necessary that about every tenth to eightieth thread in both the warp and the filling of the synthetic fabric be an electrically conductive thread. The distances between the individual threads within the lattice can be varied according to requirements, but they are preferably less than 10 centimeters, and in certain applications preferably less than 2 centimeters. In addition to a lattice of approximately 9 x 9 centimeters, a lattice of 4.5 - 5 and 4.5 - 5 cm is a specialty, since the measuring electrode commonly used according to DIN 53 482 will always come in contact with one of the threads of the lattice.

The electrically conductive threads are preferably monofilaments, but fibers, threads or multifilaments of a conductive polypropylene can be used. Preferred is the use of electrically conductive threads with a titer of 1000 to 1500 dtex.

The fabric according to the invention is suitable for all applications in which high mechanical strength and reliable dissipation of static electricity are important. It can be used to advantage, for example, in mining, or also in other fields in which the danger of dust explosions, for example, exists.

The invention also concerns a bulk materials container a so - called flexible, intermediate bulk container (FIBC) - which consists of a flexible carrier bag with handles fastened thereto (carrier loops, eyelets, straps or the like), and in which the carrier has been made of a high-strength synthetic fiber fabric of the type according to the invention.

In certain parts of the carrier, such as the top and the neck area, and in the area of the filling and dumping spouts, provision is made for a constriction of the lattice of electrically conductive threads to increase the number of intersections of the warp and filling threads. Likewise, when carrying loops or the like are used, they are advantageously made at least in part of conductive material.

In an additional embodiment, the sack part of the bulk container is provided with an inner bag. The latter, like the other materials of the bulk container, is made of a fabric which, by the incorporation of electrically conductive threads in the warp and filling, achieves a dissipation resistance of about 10^7 ohms and therefore is able to dissipate electrical charges through an appropriate ground and render them harmless.

Since a coated bulk container is required in many applications and can also be provided with a special seal at the seams, it also is possible to provide the conductive body fabric with a conductive coating of polypropylene or polyethylene; i.e., to provide such a coating not just for the top, the filling spout and/or the dump spout.

In addition to making the bulk container of conductive fabric inside and out with an appropriate coating, an additional bag liner of polyethylene is also desirable. It is then made from a conductive polyethylene into which carbon black or graphite is dispersed.

An additional improvement of the conductivity and thus of safety can be achieved by also making conductive the bonding material, such as sewing thread or the like, which joins together the individual parts of the bulk container.

Special designs or bulk containers call for a moisture barrier for the inner bag. This inner bag is at present made preferably of an aluminum sandwich film. Otherwise the liner bag can be made in accordance with the invention from an aluminum laminate film,

thus also providing a conductive surface on the inside and/or outside. Such a film can also be used as a so-called "between-bag". In a between-bag design, the outer bag is made of dissipative synthetic fabric and the inner bag of conductive polyethylene. Between these outer and inner bags is an aluminum laminate which forms a moisture barrier. For other applications other intermediate materials can be used, such as corrugated cardboard or wood. The invention also relates to strapping for fastening loads to carrying devices. Such material is made of a high-strength synthetic thread fabric in accordance with the invention.

Strapping is used instead of chains, for example, for lifting loads without scarring them--loads such as metal or plastic pipes.

Strapping is used for fastening to bags, bulk carriers and the like, and can be fastened by welding, cementing or stitching.

The preferred embodiments of the present invention will now be described with the aid of the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the structure of the weave of the fabric according to the invention.

Figure 2 is a perspective representation of a bulk container according to the invention, and strapping according to the invention.

Figure 3 is a cross sectional view of a bulk container comprising an inside bag, an intermediate bage and an outside bag.

Figure 4 is a perspective representation of a carrying strap.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In Figure 1 a synthetic fiber fabric is represented diagrammatically, into which electrically conductive threads 2 of preferably polypropylene are woven at intervals of 10 cm or less. By the use of the electrically conductive threads in the warp pattern 3 and in the filling 4 it is achieved that the synthetic fiber fabric

is filled with a lattice network of electrically conductive threads. In this manner the fabric acquires an excellent ability to dissipate static electricity.

The embodiment represented in Figure 2 is a bulk container 1 which consists of a bag 5 with strapping used to make carrier loops 7, 7'. In its top area 10 the bag has a filling spout 8, and in its bottom 11 a dumping spout 9. The bag is made from a high-strength synthetic fiber fabric in which electrically conductive threads 2 are woven into the warp and filling. These electrically conductive warp threads 3 and filling threads 4 consist of electrically weakly conductive polyolefins, preferably polypropyle ne. By this weaving into the warp and filling, the synthetic fiber fabric is provided with intersecting, electrically conductive threads in a lattice network, through which, if it is suitably grounded, the static electricity developed in the use of the bulk container, chiefly by filling and emptying it, can be dissipated.

In this lattice network of electrically conductive threads the distance between the individual threads is preferably less than 10 centimeters, but it can vary according to the conductivity required.

In the neck area 6, in the top area 10, and in the area of the filling spout 8 and dumping spout 9, the lattice network of electrically conductive threads can be constricted to optimize dissipation. Likewise, conductive material is incorporated into the material of the carrying loops to assure dissipation.

Gapless grounding during filling and dumping is important to safety, so that any possible static charges will be dissipated.

In contrast to the embodiment described above, it is also possible to coat the body weave or fabric of a liner bag that may be present. Since in general a coating is not particularly conductive, the conductivity of the fabric behind it is especially important.

Another embodiment consists in coating the body weave with a conductive film which also has a surface-area resistance or dissipative resistance of 10^7 and 10^8 ohms. The thickness of the coating in this case is unimportant.

In another embodiment, the FIBC container made of the above-described body weave is made with an inner bag of film, which

achieves similar good surface-area resistance values and a dissipative resistance of 10^7 and 10^8. Figure 3 shows the further possibility of using a laminated bag in which the outside bag 12 consists of conductive fabric and the inside bag 13 of conductive or not electrically chargeable polyethylene. It is also possible to make the outside bag of conductive fabric with an inner and/or outer dissipative coating. Lastly, it is also possible to build in a dissipative intermediate bag 14 made, for example, of aluminum foil, between the outside and inside bags.

The above-described inside bag of film can be a normal tube, but also by special fabrication it can be given the shape of the outer container with incorporated filling and dumping spouts if desired. In use, the inside and outside bags must be grounded when filling and dumping.

The strapping (7, 7') consists of the synthetic thread fabric according to the invention. Such strapping can, also be made individually or of a different shape, in order, for example, to be slung around pipes or other objects when they have to be lifted. Such strapping is illustrated in Figure 4.

There has thus been shown and described a novel high-strength synthetic fiber fabric and items made from such fabric which fulfill all the objects and advantages sought therefor. Many changes, modifications, variations and other uses and applications of the subject invention will, however, become apparent to those skilled in the art after considering this specification and the accompanying drawings which disclose preferred emodiments thereof. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

The claims form part of the disclosure of this specification.

The claims defining the invention are as follows:

1. A fabric made of synthetic fibers or plastics threads which in addition to electrically non-conductive threads also has electrically conductive threads which are woven in both in the warp and the weft, characterized in that the electrically conductive threads are made of a polyolefin and contain soot and/or graphite dispersed therein, and with the rest of the fibers and threads yield a high-strength fabric which is suitable for producing bulk containers.

2. A fabric according to Claim 1, characterized in that the elasticity modules $\in$ of the electrically conductive threads is smaller than that of the reset of the thread material woven in the warp and weft.

3. A fabric according to Claim 1 or 2, characterized in that the conductive threads in the parent substance are made of polypropylene.

4. A fabric according to one of Claims 1 to 3, characterized in that every tenth to eightieth warp (3) thread or weft (4) thread is an electrically conductive thread.

5. A fabric according to one of Claims 1 to 4, characterized in that the spacing of the electrically conductive threads relative to one another in the warp direction and/or in the weft direction is not greater than 10cm, preferably not greater than 2cm.

6. A fabric according to one of Claims 1 to 5, characterized in that the electrically conductive threads are monofilaments.

7. A fabric according to one of Claims 1 to 6, characterized in that the electrically conductive threads have a titre of 1000 to 1500 dtex.

8. A bulk container, a so-called FIBC, which consists of a flexible carrying bag (5) which has a collar region (6) and a cover region (10) with a filler neck (8) and which is provided with carrying means, for instance carrying loops (7), characterized in that the carrying bag (5) is made of a high-strength fabric of synthetic fibers or plastics threads which in addition to electrically non-conductive threads also has electrically conductive threads which are woven in both in the warp and in the weft, the electrically conductive

threads being made of polyolefins and contain soot and/or graphite dispersed therein.

9. A bulk container according to Claim 8, characterized in that the bulk container has in its cover region (10) and collar region (6) an increased number of electrically conductive threads compared with the rest of the fabric of the carrying bag.

10. A bulk container according to one of the preceding Claims 8 or 9, characterized in that the carrying loops (7) are made at least partially of conductive fabric or conductive threads.

11. A bulk container according to Claims 8 to 10, which is additionally provided in its base region (1) with an outlet connection (9), characterized in that the filler neck (8) and also the outlet connection (9) contain electrically conductive threads.

12. A bulk container according to one of the preceding Claims 8 to 11, consisting of an inner and outer bag, characterized in that the inner and/or outer bag is made of conductive fabric.

13. A bulk container according to Claim 12, characterized in that the outer bag is made of conductive material and the inner bag is made of conductive or non-electrically chargeable polyethylene.

14. A bulk container according to Claim 12 or 13, characterized in that the outer bag is made of conductive fabric and a earthing coating is produced on the inside or outside.

15. A bulk container according to Claims 12 to 14, characterized in that an intermediate bag, for instance made of aluminium foil, is inserted between the earthing inner and outer bags.

16. A carrying strap for attaching loads to support harnesses, consisting of a high-strength fabric of synthetic fibers or plastics threads, which in addition to electrically non-conductive threads also have electrically conductive threads, which are woven in both in the warp and in the weft, the electrically conductive threads being made of a polyolefin and containing soot and/or graphite dispersed therein.

17. A fabric according to any one of claims 1 to 7 substantially as hereinbefore described.

18. A bulk container according to any one of claims 8 to 15 substantially as hereinbefore described.

19. A carrying strap according to claim 16 substantially as hereinbefore described.

DATED this 11th day of February, 1993.

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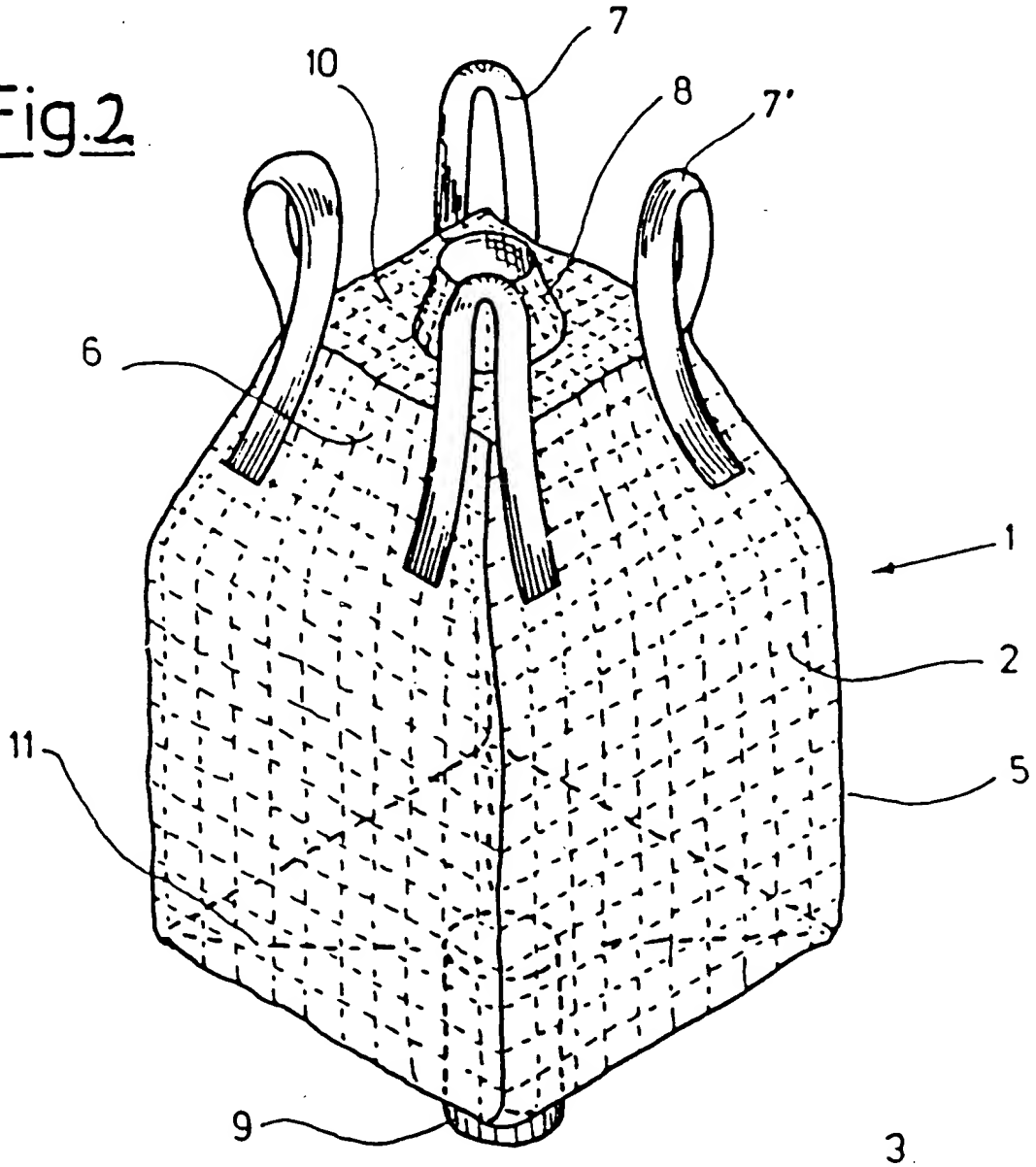
Fig.2



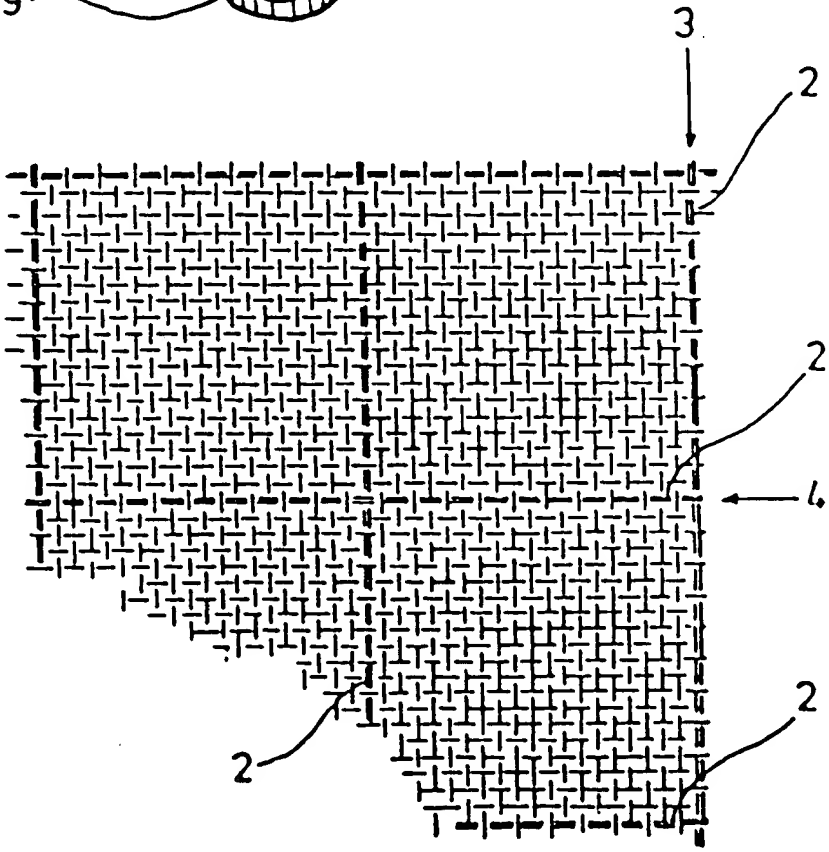


Fig.1

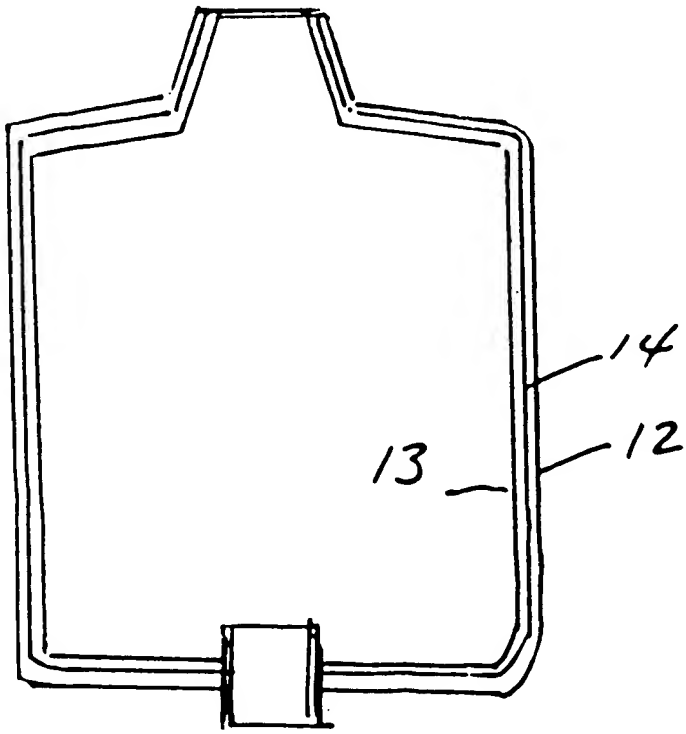


FIG. 3

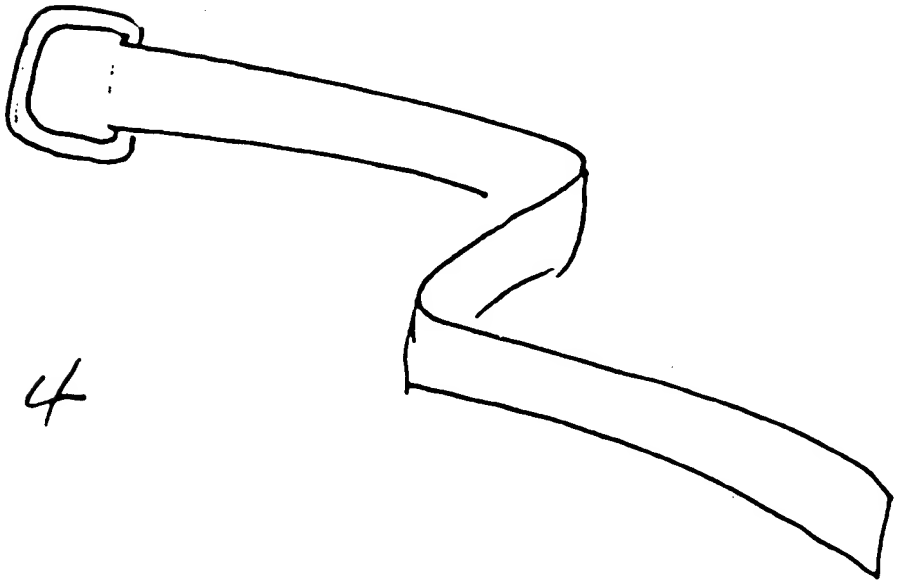


FIG. 4